REMARKS

Claims 17-19, 21, 23-26 and 56-65 are all the claims presently pending in the application. Claims 17, 21 and 23 have been amended to more particularly define the claimed invention. Claims 20, 22 and 27-55 have been canceled. Claims 56-65 have been added to claim additional features of the claimed invention.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 17-55 stand rejected under 35 U.S.C. § 102(e) as being allegedly taught by Hatano et al. (U.S. Patent No. 5,998,810), or Schetzina (U.S. Patent No. 6,046,464), or Nakamura et al. (U.S. Patent No. 5,777,350). Claims 17-55 stand rejected under the doctrine of obviousness-type double patenting as being unpatentable over claims 1-20 of Koike et al. (U. S. Patent No. 6,645,785).

These rejections are respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

The claimed invention (e.g., as recited, for example, in claim 17) is directed to a method for producing a group III nitride compound semiconductor light-emitting device. The method includes producing an emission layer comprising a multi quantum well structure (MQW) with well layers and barrier layers, doping donor impurity into a first well layer and doping acceptor impurity into a second well layer adjacent to said first well layer in a producing process of said multi quantum well structure, and forming a barrier layer without doping.

Conventional methods of forming an emission layer of a light-emitting device include doping an emission layer (e.g., a single emission layer) with an acceptor impurity and a donor impurity. However, the Coulomb forces between the acceptor and donor impurities cause a significant potential energy, resulting in a shift in the peak wavelength toward a shorter wavelength in the luminous spectrum such that a desired wavelength (e.g., 500 nm) cannot be obtained (Application at page 3, lines 5-16; page 6, lines 1-13).

The claimed invention, on the other hand, dopes a donor impurity into a first well layer and dopes an acceptor impurity into a second well layer adjacent to the first well layer in a producing process of a multi quantum well structure (Application at page 5, line 21-page 7, line 24). Thus, in the claimed invention, the acceptor impurity and the donor impurity may be separated by employing the barrier layer as an intervening layer. As a result, Coulomb's force between the acceptor impurity and the donor impurity can be decreased and luminous wavelength can be prevented from shifting to a shorter wavelength. These features are clearly described in the specification of the present Application (eg., see Application at pages 6-7, Example 4 on page 23, Example 8 on page 37, and Figure 16).

II. THE HATANO, SCHETZINA AND NAKAMURA REFERENCES

The Examiner alleges that any of Hatano, Schetzina or Nakamura teach the claimed invention. Applicant submits, however, that neither Hatano, Schetzina nor Nakamura teach or teach or suggest each and every element of the claimed invention.

Hatano discloses a light-emitting diode which includes an active layer 14 of GaN, a Mg-doped p-type cladding layer 15 of AlGaN and an Mg-doped p-type contact layer 16 of GaN (Hatano at col. 6, lines 59-67; Figure 2).

Schetzina discloses a group III-V nitride compound semiconductor device which includes an active region 112 between p-type cladding layer 114a and n-type cladding layer 114b (Schetzina at Figure 3; col. 12, lines 24-41).

Nakamura discloses a nitride semiconductor device which includes an n-type clad layer 315, an active layer 316 and a p-type clad layer 317 (Nakamura at col. 27, lines 54-67; Figure 16).

However, neither Hatano, nor Schetzina nor Nakamura teaches or suggests "*doping donor impurity into a first well layer and doping acceptor impurity into a second well layer adjacent to said first well layer in a producing process of said multi quantum well structure*", as recited, for example, in claim 17.

As noted above, unlike conventional methods of forming a multiple quantum-well structure which include doping an emission layer (e.g., a single emission layer) with an acceptor impurity and a donor impurity, the claimed invention dopes a donor impurity into a first well layer and dopes an acceptor impurity into a second well layer adjacent to the first

well layer in a producing process of a multi quantum well structure (Application at page 5, line 21-page 7, line 24).). Thus, in the claimed invention, the acceptor impurity and the donor impurity may be separated by employing the barrier layer as an intervening layer. As a result, Coulomb's force between the acceptor impurity and the donor impurity can be decreased and luminous wavelength can be prevented from shifting to a shorter wavelength.

Clearly, these features are not taught or suggested by the cited references. Indeed, none of these references teach or suggest an MQW structure having an acceptor-doped layer and a donor doped layer.

Specifically, the exemplary aspects of the claimed invention (e.g., as recited in claim 17) may include a light-emitting device with a multiple quantum-well structure. In multiple quantum-well structures, layers may be arranged as follows: a first well layer, a barrier layer, a second well layer, a barrier layer, a first well layer, a barrier layer, second well layer, barrier layer, first well layer, and so on.

Further, in the claimed invention, an acceptor impurity is doped into the first well layer and a donor impurity is doped into the second well layer (e.g., in a multiple quantum-well structure).

Therefore, as described with respect to the multiple quantum-well structure above, in the claimed invention, the acceptor impurity and the donor impurity are separated by employing the barrier layer as an intervening layer. As a result, Coulomb's force between the acceptor impurity and the donor impurity can be decreased and luminous wavelength can be prevented from shifting to a shorter wavelength. These features are clearly described in the specification of the present Application (eg., see Application at pages 6-7, Example 4 on page 23, Example 8 on page 37, and Figure 16).

Further, in the claimed invention, in order to enlarge a distance between the acceptor impurity and the donor impurity, the acceptor impurity and the donor impurity are doped alternatively into each well layer formed at each side of the barrier layer.

However, the cited references are completely unrelated to the claimed invention. Indeed, the Examiner alleges that Hatano discloses these features at col. 6, lines 59-67, Figure 2. However, as noted above, this passage merely discloses a light-emitting diode which includes an active layer 14 of GaN, a Mg-doped p-type cladding layer 15 of AlGaN and an Mg-doped p-type contact layer 16 of GaN. That is, nowhere does this passage teach or

suggest doping a donor impurity into a first well layer and dopes an acceptor impurity into a second well layer adjacent to the first well layer in a producing process of a multi quantum well structure.

Indeed, Applicant would point out that it would be completely unreasonable for the Examiner to attempt to equate the clad layers in Hatano with the MQW structure of the claimed invention. Indeed, the clad layers in Hatano are completely unrelated to an MQW. Further, in general, clad layers have a completely different function than the active layers (e.g., emission layers) of an MQW.

Likewise, the Examiner attempts to rely on Schetzina at Figure 3; col. 12, lines 24-41 to support his position. But as noted above, this passage merely discloses a group III-V nitride compound semiconductor device which includes an active region 112 between p-type cladding layer 114a and n-type cladding layer 114b. As in Hatano, nowhere does this passage teach or suggest doping a donor impurity into a first well layer and dopes an acceptor impurity into a second well layer adjacent to the first well layer in a producing process of a multi quantum well structure.

Further, the Examiner attempts to rely on Nakamura at col. 27, lines 54-67; Figure 16 to support his position. However, as noted above, this passage and Figure merely disclose a nitride semiconductor device which includes an n-type clad layer 315, an active layer 316 and a p-type clad layer 317. As noted above, the clad layers are completely unrelated to the active layers of an MQW structure. Thus, nowhere does this passage or Figure in Nakamura teach or suggest doping a donor impurity into a first well layer and dopes an acceptor impurity into a second well layer adjacent to the first well layer in a producing process of a multi quantum well structure.

Therefore, Applicant respectfully submits that there are elements of the claimed invention that are not taught or suggested by the cited references. Therefore, the Examiner is respectfully requested to withdraw these rejections.

III. THE DOUBLE PATENTING REJECTION

The Examiner alleges that claims 1-20 of Koike make obvious the claimed invention. However, Applicant would point out to the Examiner that **the present Application is a Divisional Application of U. S. Patent Application Ser. No. 09/909,895 which issued as**

the Koike patent.

Indeed, the Examiner in that parent application (Ser. No. 09/909,895) in an Office Action dated August 20, 2002 forced Applicant to elect from between Species I (claims 1-16), Species II (claims 17-27) and Species III (claims 28-55) stating that these species are "patentably distinct".

Applicant respectfully notes that the third sentence of 35 USC §121 prohibits the use of a patent issuing on an application with respect to which a requirement for restriction has been made, or on an application filed as a result of such a requirement, as a reference against any divisional application, if the divisional application is filed before the issuance of the patent. Thus, the Examiner is prohibited under 35 USC §121 from using the parent application as a reference in this double patenting rejection.

Therefore, the Examiner is respectfully requested to withdraw this rejection.

IV. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 17-19, 21, 23-26 and 56-65, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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